

WSP Environment & Energy 2025 Gateway Place Suite 435 San Jose, CA 95110

Tel: +1 408 453 6100 Fax: +1 408 453 0496 http://www.wspenvironmental.com



XRF Investigation Results for the Quemetco Inc., Facility Indianapolis, Indiana

U.S. EPA ID# IND000199653

Prepared by
WSP Environment & Energy
2025 Gateway Place, Suite 435
San Jose, CA 95110

Ruhard E. Freudenblier

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Richard E. Freudenberger, Vice President of WSP Environment & Energy, Project Manager

Date

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1 Introduction

On behalf of Quemetco Inc. (Quemetco), WSP Environment & Energy (WSP) prepared this XRF Investigation Report for the Quemetco facility located at 7870 West Morris Street, in Indianapolis, Indiana (Figure 1). On May 19, 2008, WSP submitted a revised Workplan to the United States Environmental Protection Agency Region 5 (U.S. EPA) for additional sampling at the Quemetco facility. The Workplan included the collection of soil samples from the northeast area, slag waste pile area, areas around the ponds and along Julia Creek. Surface water samples were to be collected from Pond #3 and Julia Creek. Collection of sediment samples were proposed for all three ponds and Julia Creek. The U.S. EPA provided comments on the revised Workplan in a letter dated October 8, 2009. In their letter, U.S. EPA requested that soil samples be collected and analyzed using X-ray fluorescence (XRF) technology. The letter describes a grid-space sampling approach for completing site-wide characterization. A Sampling and Analysis Plan was prepared in accordance with the U.S. EPA request and submitted to the U.S. EPA on February 19, 2010. The Sampling and Analysis Plan describes the methodology for collecting and analyzing soil samples to further delineate the extent of soil impacted by lead.

This investigation report describes the sampling procedures for collecting and analyzing soil samples and discusses the extent of soil impacted by lead. All work was completed in accordance with WSP's XRF Sampling and Analysis Plan dated February 19, 2010.

The XRF investigation was completed before formally revising the May 19, 2008 Workplan which will be revised to incorporate the results of this investigation and to address U.S. EPA's letter dated October 8, 2009.

2 Field Activities

The sampling activities were conducted by WSP personnel during two different time periods: April 12 through April 20, 2010 and October 20 through October 22, 2010. The investigation was performed in accordance with WSP's XRF Sampling and Analysis Plan dated February 19, 2010. During the April sampling event, samples were collected from Zone-1 and part of Zone-2. During the October sampling event, samples were collected from the remainder of Zone-2, and Zone-3 and Zone-4. Table 1 provides a list of all the XRF data collected.

2.1 SOIL SAMPLING PROCEDURES

During the April sampling event, a 70-foot by 70-foot grid was laid out in each Zone using a compass and tape measure. This grid was consistent with that depicted in Figure 3. The corners of each grid space were marked by orange flags. According to the manufacturer, the XRF is most accurate when analyzing soil with moisture content below 20 percent. Thus, an area with low soil moisture, preferably less than 20 percent, was chosen within each grid space. The exact sample location was recorded using a Trimble ProXH GPS. Due to the dense tree cover, it was difficult for the GPS to receive strong satellite signals. This, in turn, resulted in some measurement inaccuracy. Prior to the October sampling event, sample locations within the 70-foot by 70-foot grid were pre-selected. The GPS coordinates of these locations were recorded. During the October sampling event, a Garmin GPSMAP 76CSx was used to locate the pre-determined locations. During the October sampling, GPS accuracy improved due to the lack of foliage.

Field lead analysis was performed using an Innov-X Alpha Series XRF instrument. The instrument's calibration was checked twice a day using NIST standards. If the instrument did not meet the calibration specifications, it was recalibrated. The XRF was programmed to analyze a sample for 60 seconds.

Once a suitable sample location was established, a dedicated decontaminated stainless steel spoon was used to prepare the sampling location. Debris, rocks, and organic matter were cleared away from the sample location. For surface samples, the spoon was used to smooth and compact the surface. A new Ziploc sandwich bag was placed over the analysis portion of the XRF instrument. This bag was discarded after each sample reading to prevent cross contamination. Sampling alternated between the collection of a surficial sample and the collection of both a surficial and a subsurface sample. Subsurface samples were collected at the same location that surface samples were measured. To obtain a subsurface sample, a decontaminated spoon was used to collect soil from 0 to 6 inches. This sample was then placed in a clean Ziploc plastic bag and homogenized. Each bag was labeled and analyzed at the end of the day using the XRF instrument. At every location after sample collection, percent soil moisture data was obtained using a General DSMM500 Soil Moisture Meter. New, disposable nitrile gloves were used for each sample collection. For each sample, the following information was recorded in a field notebook: sample zone location, sample GPS coordinates, sample identification numbers, date and time, sample depth, field lead concentration and description of any visible evidence of soil contamination (i.e., odor, staining). Sample nomenclature included the zone from which the sample was collected, the grid space from which the sample was collected, and the depth at which the sample was collected. For example, sample Z1-1 (0") was collected from the surface (0") in Zone-1, grid space 1. All waste generated during sampling was disposed of as hazardous waste consistent with Quemetco Inc.'s waste handling practices.

A total of 12 confirmation samples for laboratory analysis were collected during the two sampling events. These confirmation samples were collected with decontaminated stainless steel spoons, placed in labeled Ziploc bags, and homogenized. The soil was then transferred to pre-cleaned, labeled, laboratory

supplied sample jars. These jars were stored in a cooler with ice until delivery to the lab. A chain of custody was maintained for the samples.

2.2 LAB ANALYSES OF SAMPLES

The confirmation samples collected from the site were analyzed for total lead by Microbac Laboratories (Microbac) located at 250 West 84th Drive in Merrillville, Indiana, using inductively coupled plasma-mass spectrometry (ICPMS) in accordance with SW-846 Method 6020A. Microbac is accredited by the National Environmental Laboratory Accreditation Program and provided a CLP-level IV-equivalent data package. A total of 12 confirmation samples (six surface and six subsurface) were analyzed by Microbac.

3 Results

A total of 229 (minus 1 sample that was not recorded) surface and 110 subsurface soil samples were analyzed for lead using an Innov-X Alpha Series XRF instrument. Results for XRF field analysis are listed in Table 1. A total of 6 surface and 6 subsurface confirmation samples were collected and analyzed for total lead by Microbac Laboratories. Confirmation sample results and corresponding XRF analysis results are listed in Table 2. Figure 2 depicts the locations of each sample collected as determined by using GPS in the field. The effects of poor satellite reception can be seen in the northwest potion of Zone-1 in Figure 2. Samples were taken within each grid space (Figure 3); however, the coordinates obtained with the GPS did not necessarily reflect the precise location at which each sample was collected. Additionally, the GPS coordinates for sample locations Z1-16, Z1-81, Z1-101, Z2-140, Z2-159, Z2-160, Z2-161, Z2-162 and Z4-218 did not accurately depict the sample locations as determined by known landmarks. Therefore, these sample locations were adjusted in Figures 2, 4 and 5. Figure 3 shows empty grid spaces in Zones-1, 3, and 4 where no samples were collected. The empty grid spaces in Zone-1 were located within the fence surrounding active operations; therefore, no samples were collected. During the October sampling, on-site Quemetco personnel informed WSP that the eastern portions of Zone-3 and Zone-4 were not within Quemetco's property; therefore, no samples were taken in the blank grid spaces of Zone-3 and Zone-4 as shown in Figure 3. Surficial lead concentrations in soil measured via XRF are depicted in Figure 4. A color scheme was used to highlight the different concentration ranges. For example, all samples with a lead value between 0 and 400 ppm are colored green. The subsurface lead concentrations in soil collected from 0 to 6 inches are depicted in Figure 5. The color scheme used in Figure 5 is identical to that which was used in Figure 4.

3.1 **ZONE-1**

Zone-1 included the area north of the facility extending approximately 350 feet beyond the northern fence line of the plant. Zone-1 also included the area west of the facility extending to the railroad berm. Zone-1 was sampled during the April sampling event. A total of 201 samples were taken: 130 XRF surface samples, 64 XRF subsurface samples, 3 surface lab confirmation samples, and 4 subsurface lab confirmation samples. Some low-lying areas contained standing water, shallow ponds or thick mud. A berm was located along the northern property boundary within grid spaces 44, 48, 52 and 56. The majority of sample locations 49 to 110 were located in densely wooded areas where access was extremely difficult due to overgrown vegetation. There was an elevated rail bed (approximately 30 feet above grade) which ran parallel with the westem property boundary. Sample locations 114 through 125 were taken on this elevated rail bed. Soil moisture ranged from 0 to 48 percent. Ninety-five percent of the samples were taken in location where the soil moisture was less than 20 %.

XRF measurements of lead concentrations in Zone-1 ranged from 65 ppm to 58,132 ppm for surface samples and 86 ppm to 58,871 ppm for subsurface samples. The highest lead concentrations in Zone-1 were detected in the northeastern portion of the zone and within the grid spaces adjacent to the west side of the slag pile. In the northeastern portion of Zone-1, surface concentrations ranged from 1,715 ppm at sampling location Z1-28(0") to 58,132 ppm at Z1-7(0"). Subsurface concentrations in this portion of Zone-1 ranged from 1,908 ppm at Z1-28(0-6") to 32,518 at Z1-2(0-6"). The grid spaces adjacent to the slag pile had surface concentrations ranging from 345 ppm at Z1-130(0") to 56,257 ppm at Z1-97(0"). Subsurface concentrations ranged from 8,000 ppm at Z1-113(0-6") to 58,871 ppm at Z1-98(0-6").

In Zone-1, 30% (39 of 130) of the surface samples had concentrations below the 400 ppm action level while 22% (14 of 64) of the subsurface samples were below the action level. Figure 6 shows the distribution of samples and lead concentrations. For Zone-1, the distribution of lead concentrations in the

surface and subsurface is similar. For example, both surface and subsurface samples had 33% of the samples with lead concentrations between 1,001 and 10,000 ppm.

Three surface and four subsurface samples were collected from Zone-1 and sent to Microbac for lab analysis. The average percent difference between the seven confirmation samples and XRF samples was 36.7%. Subsurface sample Z1-21(0-6") had the lowest percent difference with 2.7% while surface sample Z1-33(0") had a 113% difference. Confirmation sample results and the respective percent differences are listed in Table 1 and depicted in Figure 10.

3.2 **ZONE-2**

Zone-2 includes the area adjacent to and south of Pond Number 3. A portion of this Zone was sampled in April; the remaining samples were collected during the October sampling event. The north edge of Zone-2 is adjacent to the water treatment facility. The eastern edge of the Zone runs parallel with facility's parking lot, as well as Quemetco Drive. Within the southeastern portion of the Zone, grid spaces 141,142,143, and 144 were disturbed by construction activities and had heavy equipment parked in the sampling areas during the April sampling event. The southern portion of Zone-2 consisted of an open grassy field. The western portion of Zone-2 is situated between the slag pile and Pond Number 3. This area is moderately to densely wooded. A total of 57 samples were collected in Zone-2. Thirty-eight XRF surface samples and 18 XRF subsurface samples were collected. One surface sample was collected for laboratory analysis. Soil moisture ranged from 0% to 46%. Soil moisture data were not recorded for 7 samples in this zone. Eighty-six percent of the samples were collected in locations where the soil moisture was less than 20%.

XRF measurements of lead concentrations in Zone-2 ranged from 48 ppm to 34,264 ppm for surface samples and 50 ppm to 11,109 ppm for subsurface samples. The majority of the elevated lead concentrations in Zone-2 are located in the northern and eastern portions of the Zone. Surface concentrations along Quemetco Drive and the facility parking lot range from 1,021 ppm at Z2-161(0") to 34,264 ppm at Z2-151(0"). Subsurface concentrations in this portion of Zone-2 range from 643 ppm at Z2-161(0-6") to 7,789 ppm at Z2-141(0-6").

In Zone-2, 26% (10 of 38) of the surface samples had concentrations below the 400 ppm action level while 44% (8 of 18) of the subsurface samples were below the action level. Figure 7 shows the distribution of samples and their concentrations. For Zone-2, the distribution of concentration levels is dominated by surface and subsurface samples in the 1,001-10,000 ppm range and subsurface samples in the 0-400 ppm range.

One confirmation surface sample, Z2-151(0") was collected and sent to Microbac for lab analysis. The percent difference between the confirmation sample and the XRF sample was 96%. Confirmation sample results and respective percent differences are listed in Table 1 and depicted in Figure 10.

3.3 ZONE-3 AND ZONE-4

Zone-3 and Zone-4 were combined as only nine grid spaces in Zone-3 were on Quemetco's property. Zone-3 is located adjacent to the facility immediately to the east. Zone-4 is located south of the facility and to the east of the parking lot. Both Zones are located in densely wooded areas. Ponds Number 1 and 2 are located in Zone-4. During the October sampling event, Pond Number 1 contained water, while Pond Number 2 was almost dry. The ponds did not impede in sample collection as dry areas within each grid space were able to be located. A total of 92 samples were collected: 60 XRF surface samples, 28 XRF subsurface samples, 2 surface lab confirmation samples. Soil moisture ranged from 0.2 to 75 percent. Soil moisture data was not collected for 31

samples in Zone-3 and Zone-4. Eighty-eight percent of the samples were taken in locations where the soil moisture was less than 20 percent.

XRF measurements of lead concentrations in Zone-3 and Zone-4 ranged from 46 ppm to greater than 100,000 ppm for surface samples and 173 ppm to 46,951 ppm for subsurface samples. The highest lead concentrations in the areas sampled occur in Zone-3 along the eastern fence line of the facility and in the westem portion of Zone-4 along Quemetco Drive. Surface samples of lead in Zone-3 ranged from 2,895 ppm at Z3-221(0") to greater than 100,000 ppm at Z3-225(0"), while subsurface samples reported levels between 9,267 at Z3-222(0") ppm and 94,389 ppm at Z3-224(0"). Lead levels in Zone-4 along Quemetco Drive were lower with surface levels ranging from 3,875 ppm at Z4-199(0") to 27,619 ppm at Z4-214(0"); subsurface levels ranged from 1,784 ppm at Z4-184(0-6") to 29,728 ppm at Z4-201(0-6").

In Zone-3 and Zone-4, 8% (5 of 60) of the surface samples had concentrations below the 400 ppm action level while 4% (1 of 28) of the subsurface samples were below the action level. Figure 8 shows the distribution of samples and their concentrations. The distribution of lead concentrations in surface and subsurface samples are similar with the most frequent number of samples between 1,001 ppm and 10,000 ppm.

Two surface and two subsurface samples were collected and sent to Microbac for lab analysis. The average percent difference between the four confirmation samples and XRF samples was 24.7%. Surface sample Z4-177(0") reported the lowest percent difference with 11.9% while surface sample Z4-205(0") reported a 40.4% difference. Confirmation sample results and respective percent differences are listed in Table 1 and depicted in Figure 10.

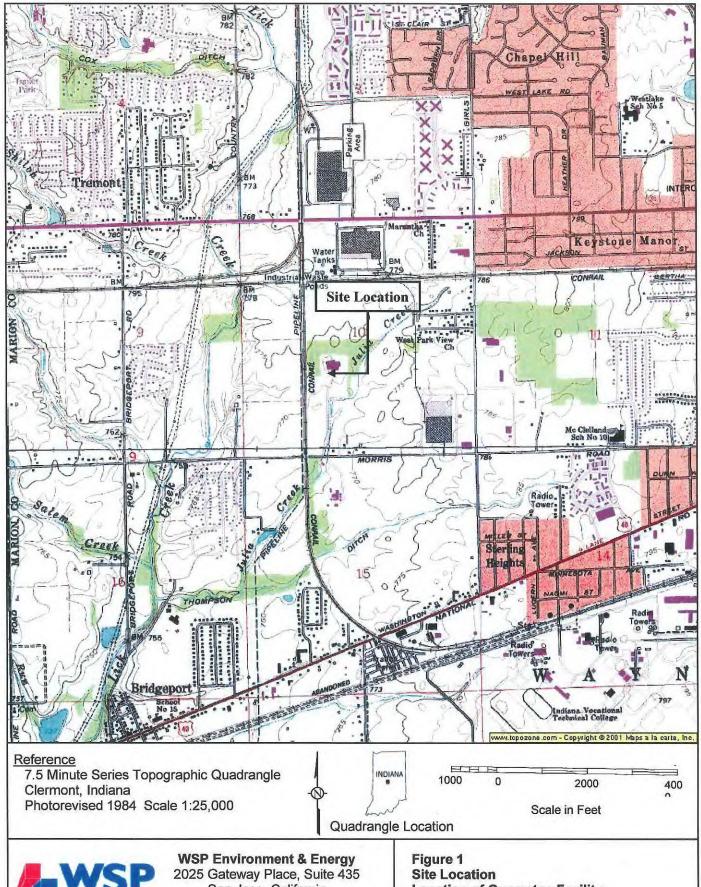
4 Conclusion

Based on surface and subsurface XRF data combined, 23% (77 of 338) of the samples analyzed were below the action level of 400 ppm. XRF analyses of surface and subsurface soil samples show 24% (54 of 228) and 21% (23 of 110) of samples were below 400 ppm, respectively. Generally, both surface and subsurface concentrations (collected from the same sample location) are either above or below the action level. There are only 6 cases in which either the surface or subsurface sample are below the action level, while the other sample at the same location is above the action level. As shown by the tight grouping of plotted data in Figure 9, there does not appear to be a difference between the concentrations in surface and subsurface samples collected at the same location.

A total of 12 lab samples were analyzed by Microbac laboratories for lead via ICPS. The results of the lab analysis can be found in Table 2. This table also shows the relative percent difference between the field XRF samples and the corresponding laboratory samples. As can be seen in Figure 10, relative percent differences for XRF samples between 315 ppm and 1295 ppm are below 22%. This relative percent difference is below the maximum of 25% set forth in the XRF Sampling and Analysis Plan dated February 19, 2010. XRF sample concentrations above 1295 ppm demonstrated a much greater relative percent difference with values up to 113%. Thus, as concentrations of lead increase, so does the relative percent difference. As noted above, samples with concentrations near the action level return acceptable relative percent differences. Although some XRF samples returned results for which the relative percent differences are outside of the workplan criteria, WSP believes it is inappropriate to deem this data invalid.

With the completion of this XRF investigation, the surface and near surface soils (0-6 inches bgs) outside of the operating fence of the plant have been thoroughly characterized. This data will be used in the completion of the Corrective Measures Study for the Quemetco site.

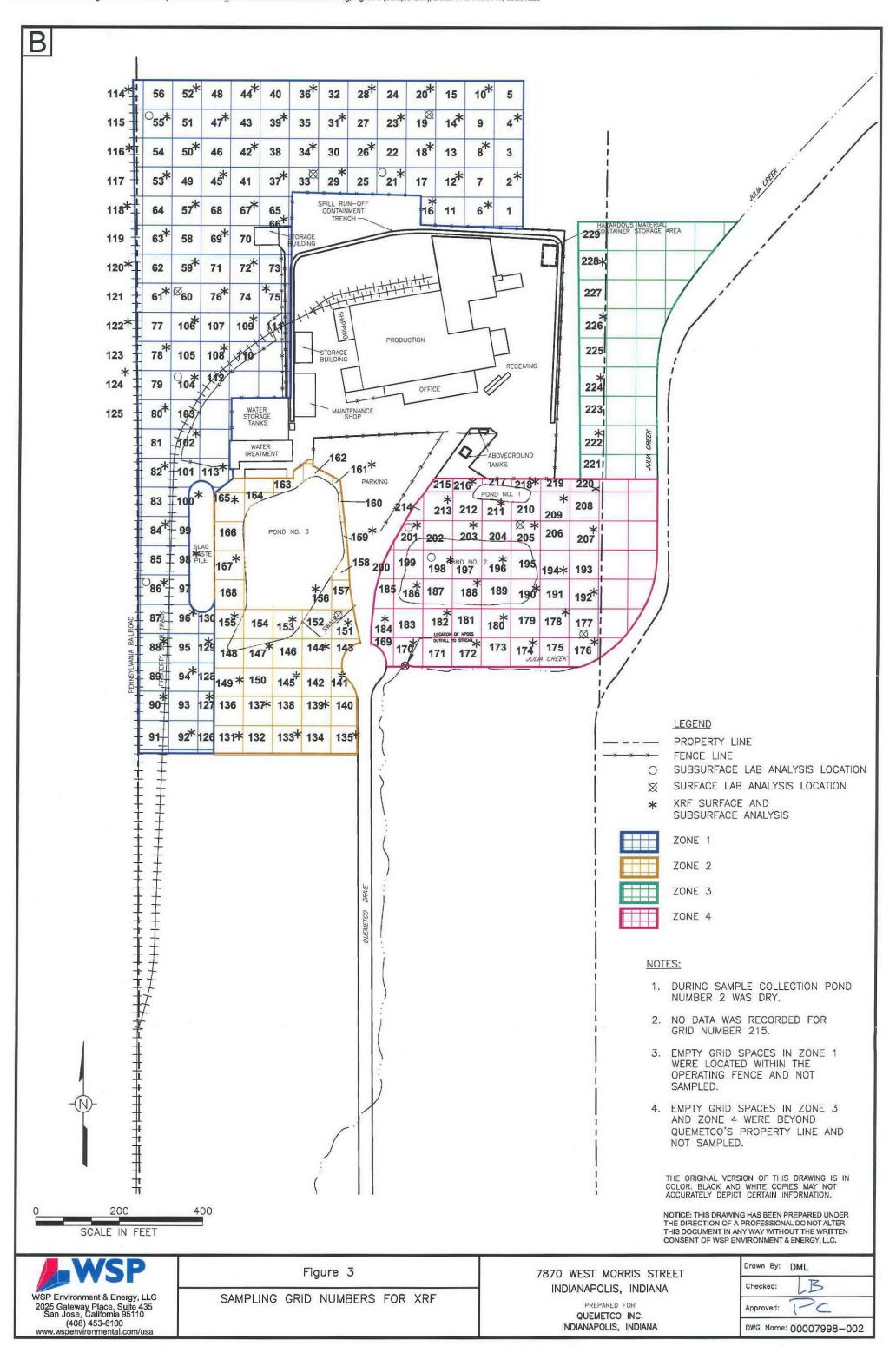
Figures

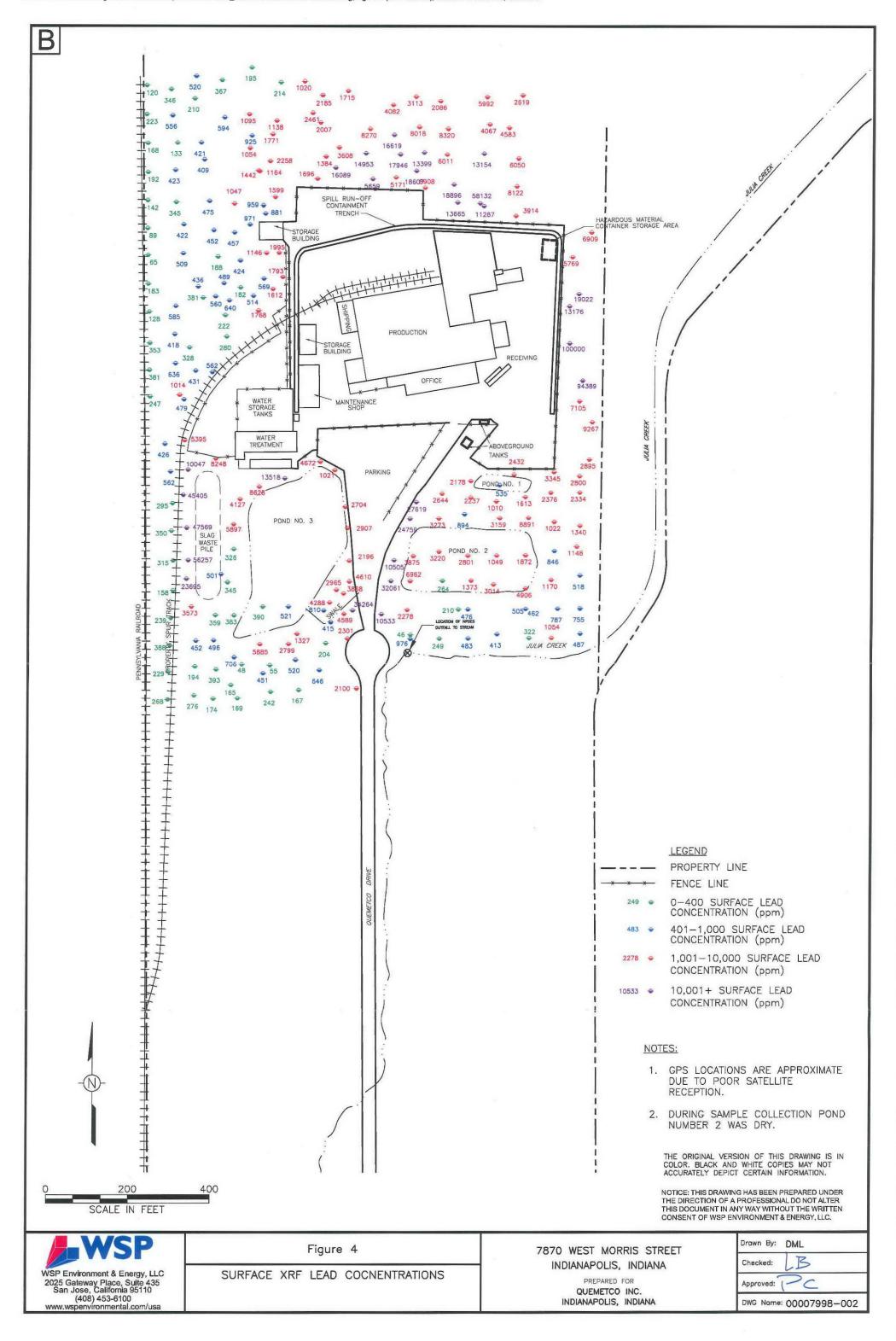


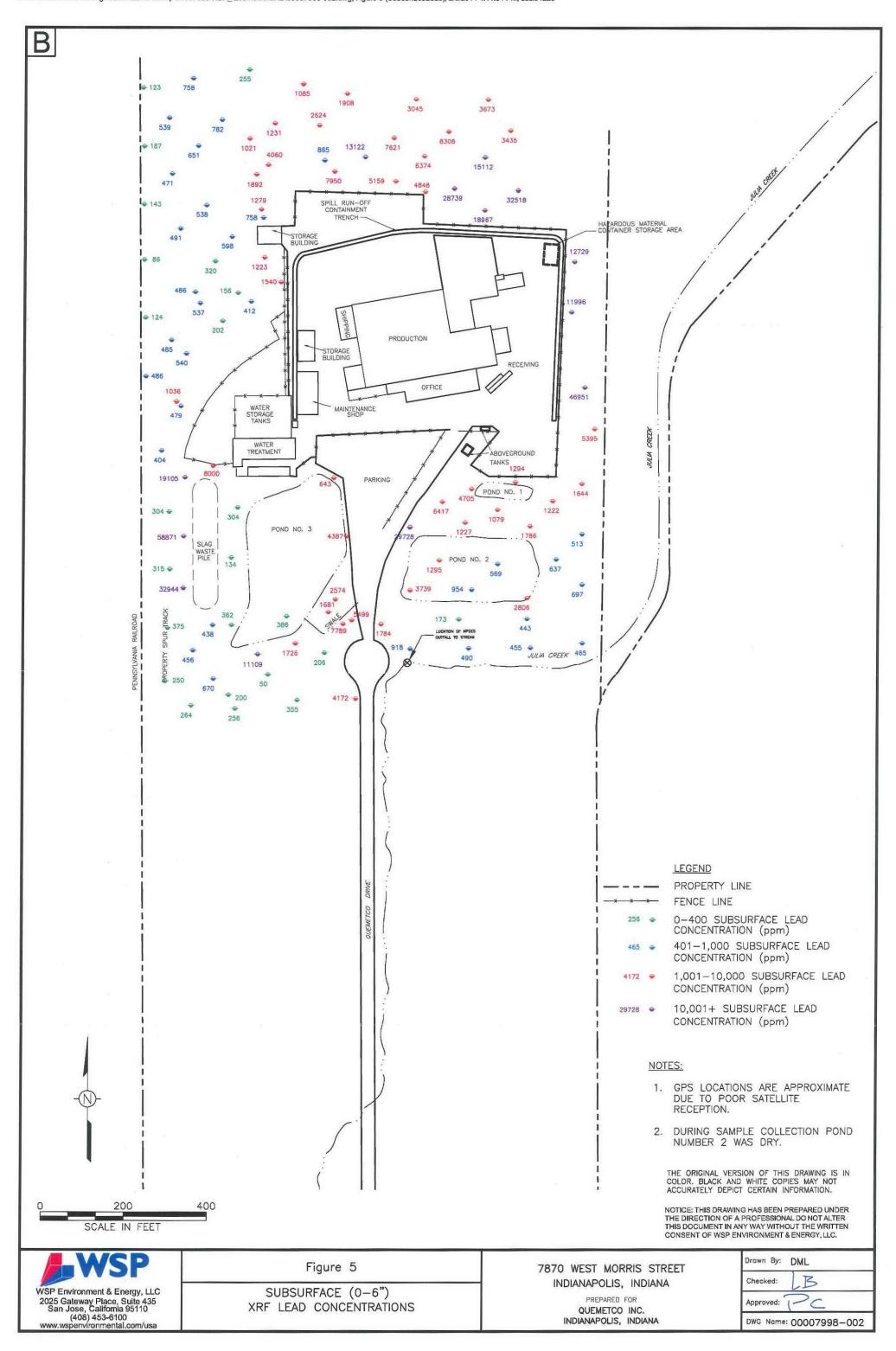


San Jose, California (408) 453-6100

Location of Quemetco Facility Indianapolis, Indiana







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QUEMETCO INC.

EGC

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QUEMETCO INC.

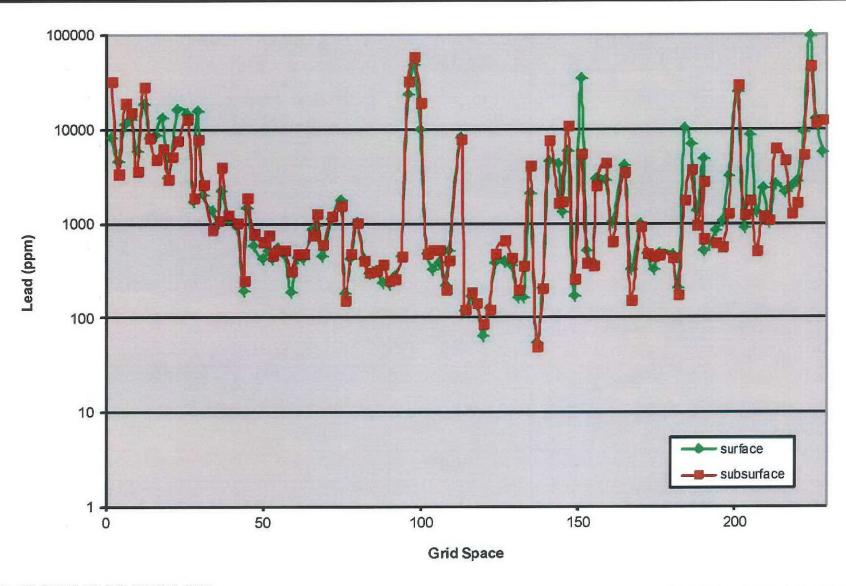
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QUEMETCO INC.

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SURFACE AND SUBSURFACE LEAD CONCENTRATIONS

QUEMETCO INC. FACILITY INDIANAPOLIS, INDIANA

PREPARED FOR QUEMETCO INC.

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RELATIVE PERCENT DIFFERENCES

INDIANAPOLIS, INDIANA

PREPARED FOR

QUEMETCO INC.

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Tables

Table 1 XRF Sampling Data April 12-21 and October 20-22 2010 XRF Investigation Results

Quemetco Inc. Facility Indianapolis, Indiana

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z1-1 (0")	3914	66	0.0
Z1-2 (0")	8122	88	1.1
Z1-2 (0-6")	32518	482	13.9
Z1-3 (0")	6050	64	0.7
Z1-4 (0")	4583	51	1.1
Z1-4 (0-6")	3435	40	19.7
Z1-5 (0")	2619	31	11.0
Z1-6 (0")	11287	130	7.9
Z1-6 (0-6")	18967	249	13.3
Z1-7 (0")	58132	1018	7.2
Z1-8 (0")	13154	162	7.1
Z1-8 (0-6")	15112	174	17.0
Z1-9 (0")	4067	43	9.0
Z1-10 (0")	5992	87	9.6
Z1-10 (0-6")	3673	42	7.4
Z1-11 (0")	13665	176	8.2
Z1-12 (0")	18896	242	8.1
Z1-12 (0-6")	28739	401	9.5
Z1-13 (0")	6011	62	10.5
Z1-14 (0")	8320	96	10.6
Z1-14 (0-6")	8308	93	14.0
Z1-14 (0-0) Z1-15 (0")	2086	25	14.9
Z1-16 (0")	8908	102	8.1
Z1-16 (0 -6")	4848	58	8.7
Z1-17 (0")	18607	241	8.9
Z1-17 (0") Z1-18 (0")	13399	156	11.4
Z1-18 (0 -6")	6374	70	8.2
Z1-18 (0-0) Z1-19 (0")	8018	90	15.7
Z1-19 (0") Z1-20 (0")	3113	35	7.5
Z1-20 (0 ·) Z1-20 (0-6")	3045	36	15.1
Z1-20 (0-0) Z1-21 (0")	5171	62	
• •	5159	63	7.1 9.6
Z1-21 (0-6") Z1-22 (0")	3139 179 4 6		
Z1-22 (0") Z1-23 (0")	16619	226	7.9 7.5
	7621	208	
Z1-23 (0-6")	4082	87	8.6
Z1-24 (0")		47	17.1
Z1-25 (0")	5659	64	8.2
Z1-26 (0")	14953	183	7.1
Z1-26 (0-6")	13122	152	10.3
Z1-27 (0")	8270	96	15.4
Z1-28 (0")	1715	18	14.9
Z1-28 (0-6")	1908	26	16.1
Z1-29 (0")	16089	198	9.2
Z1-29 (0-6")	7950	89	11.3
Z1-30 (0")	3608	41	16.0
Z1-31 (0")	2007	66	11.7

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z1-31 (0-6")	2624	32	13.7
Z1-32 (0")	2185	25	8.8
Z1-33 (0")	1696	20	15.1
Z1-34 (0")	1384	20	10.7
Z1-34 (0-6")	865	16	13.2
Z1-35 (0")	2461	30	14.7
Z1-36 (0")	1020	17	15.6
Z1-36 (0-6")	1085	19	18.7
Z1-37 (0")	2258	26	15.0
Z1-37 (0-6")	4060	47	21.6
Z1-38 (0")	1771	24	13.3
Z1-39 (0")	1138	15	13.9
Z1-39 (0-6")	1231	18	23.9
Z1-40 (0")	214	7	11.4
Z1-41 (0")	1164	16	8.1
Z1-42 (0")	925	14	7.7
Z1-42 (0-6")	1021	16	8.3
Z1-43 (0")	1095	16	11.9
Z1-44 (0")	195	6	16.0
Z1-44 (0-6")	255	7	23.0
Z1-45 (0")	1442	19	12.4
Z1-45 (0-6")	1892	27	13.0
Z1-46 (0")	1054	15	9.6
Z1-47 (0")	594	10	11.5
Z1-47 (0-6")	782	13	12.7
Z1-48 (0")	367	8	16.2
Z1-49 (0")	409	9	12.3
Z1-50 (0")	421	8	17.5
Z1-50 (0-6")	651	11	14.1
Z1-51 (0")	210	6	17.8
Z1-52 (0")	520	10	18.5
Z1-52 (0-6")	758	14	24.3
Z1-53 (0")	423	11	10.3
Z1-53 (0-6")	471	11	11.1
Z1-54 (0")	133	6	9.8
Z1-55 (0")	556	11	7.9
Z1-55 (0-6")	539	12	10.2
Z1-56 (0")	346	. 9	9.8
Z1-57 (0")	475	10	17.7
Z1-57 (0-6")	538	10	23.2
Z1-58 (0")	452	10	13.4
Z1-59 (0")	188	6	11.9
Z1-59 (0-6")	320	8	15.3
Z1-60 (0")	489	10	7.4
Z1-61 (0")	436	9	12.8
Z1 - 61 (0-6")	486	10	19.7
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Table 1 (continued) XRF Sampling Data April 12-21 and October 20-22 2010 XRF Investigation Results

Quemetco Inc. Facility Indianapolis, Indiana

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z1-62 (0")	509	10	15.4
Z1-63 (0")	422	9	17.4
Z1-63 (0-6")	491	11	47.7
Z1-64 (0")	345	9	11.0
Z1-65 (0")	1599	21	13.2
Z1-66 (0")	881	14	16.4
Z1-66 (0-6")	758	16	27.2
Z1-67 (0")	959	14	17.8
Z1-67 (0-6")	1279	18	18.6
Z1-68 (0")	1047	16	9.0
Z1-69 (0")	457	10	11.1
Z1-69 (0-6")	598	11	13.6
Z1-70 (0")	971	15	11.6
Z1-70 (0")	424	10	12.3
Z1-72 (0")	1146	19	10.4
Z1-72 (0-6")	1223	20	15.5
Z1-72 (0-0) Z1-73 (0")	1995	29	13.5
Z1-74 (0")	569	12	17.0
Z1-75 (0")	1793	26	
Z1-75 (0-6")	1540	23	10.8 19.9
Z1-76 (0")	182	6	7.6
Z1-76 (0-6")	156	6	
Z1-70 (0-0) Z1-77 (0")	585		17.8
Z1-77 (0")		12	9.2
* /	418 485	10	13.8
Z1-78 (0-6")		11	17.6
Z1-79 (0")	636	14	12.9
Z1-80 (0")	1014	17	13.7
Z1-80 (0-6")	1036	20	15.1
Z1-81 (0")	562	12	7.2
Z1-82 (0")	426	10	4.7
Z1-82 (0-6")	404	10	13.5
Z1-83 (0")	562	13	1.3
Z1-84 (0")	295	10	0.0
Z1-84 (0-6")	304	9	8.6
Z1-85 (0")	350	10	0.0
Z1-86 (0")	315	10	0.0
Z1-86 (0-6")	315	10	4.7
Z1-87 (0")	158	7	0.0
Z1-88 (0°)	239	8	0.0
Z1-88 (0-6")	375	10	11.3
Z1-89 (0°)	388	10	1.1
Z1-90 (0")	229	8	0.0
Z1-90 (0-6")	250	8	8.9
Z1-91 (0")	268	8	0.0
Z1-92 (0")	276	7	19.2
Z1-92 (0-6")	264	7	24.4

XRF Investigation Results

Quemetco Inc. Facility Indianapolis, Indiana

Z1-93 (0")	194	6	16.5
Z1-94 (0")	452	11	10.7
Z1-94 (0-6")	456	10	15.8
Z1-95 (0")	3573	37	12.6
Z1-96 (0")	23695	324	9.3
Z1-96 (0-6")	32944	475	10.8
Z1-97 (0")	56257	974	0.0
Z1-98 (0")	47569	794	0.0
Z1-98 (0-6")	58871	1096	10.7
Z1-99 (0")	45405	752	9.3
Z1-100 (0")	10047	110	7.6
Z1-100 (0-6")	19105	229	15.6
Z1-101 (0")	5395	68	0.0
Z1-102 (0")	479	12	0.0
Z1-102 (0-6")	479	11	0.0
Z1-103 (0")	431	6	0.0
Z1-104 (0")	328	9	10.4
Z1-104 (0-6")	540	12	19.2
Z1-105 (0")	560	12	10.5
Z1-106 (0")	381	8	13.4
Z1-106 (0-6")	537	11	18.5
Z1-107 (0")	640	12	14.6
$Z1-108 (0^{\circ})$	222	7	15.7
Z1-108 (0-6")	202	7	21.3
Z1-109 (0")	514	12	0.0
Z1-109 (0-6")	412	10	14.6
Z1-110 (0")	1768	29	10.4
Z1-111 (0")	1612	25	0.0
Z1-112 (0")	280	8	14.7
Z1-113 (0")	8248	107	0.0
Z1-113 (0-6")	8000	104	6.4
Z1-114 (0")	120	7	0.0
Z1-114 (0-6")	123	6	14.0
Z1-115 (0")	223	8	0.0
Z1-116 (0")	168	8	0.0
Z1-116 (0-6")	187	7	0.0
Z1-117 (0")	192	7	0.0
Z1-117 (0")	142	7	0.0
Z1-118 (0-6")	143	7	8.8
Z1-119 (0")	89	5	0.0
Z1-119 (0")	65	5	0.0
Z1-120 (0-6")	86	5	15.7
Z1-121 (0")	183	8	0.0
Z1-121 (0")	128	6	0.0
Z1-122 (0-6")	124	6	5.0
~1~14~ (U-U)	124	11	0.0

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z1-124 (0")	381	11	7.9
Z1-124 (0-6")	486	13	0.0
Z1-125 (0")	247	10	0.0
Z1-126 (0")	174	6	17.0
Z1-127 (0")	393	9	12.2
Z1-127 (0-6")	670	13	22.4
Z1-128 (0")	496	9	10.4
Z1-129 (0")	359	10	2.3
Z1-129 (0-6")	438	11	12.7
Z1-130 (0")	345	9	7.5
Z2-131 (0")	165	6	17.5
Z2-131 (0-6")	200	6	22.4
Z2-132 (0")	242	7	14.5
Z2-133 (0")	167	7	0.0
Z2-133 (0-6")	355	9	16.6
Z2-134 (0")	646	14	0.0
Z2-135 (0")	2100	34	0.0
Z2-135 (0-6")	4172	54	8.0
Z2-136 (0")	48	4	10.7
Z2-137 (0")	55	4	0.0
Z2-137 (0-6")	50	4	7.4
Z2-138 (0")	520	12	13.9
Z2-139 (0")	204	6	17.8
Z2-139 (0-6")	206	7	46.0
Z2-140 (0")	2301	35	0.0
Z2-141 (0")	4589	51	8.5
Z2-141 (0-6")	7789	88	25.6
Z2-142 (0")	415	8	22.0
Z2-143 (0")	3868	49	0.4
Z2-144 (0")	4288	58	7.5
Z2-144 (0-6")	1681	26	23.5
Z2-145 (0")	1327	19	11.3
Z2-145 (0-6")	1726	24	20.7
Z2-146 (0")	2799	39	3.2
Z2-147 (0")	5885	73	2.5
Z2-147 (0-6")	11109	139	-
Z2-148 (0")	706	15	12.0
Z2-149 (0")	169	7	7.7
Z2-149 (0-6")	256	9	=
Z2-150 (0")	451	12	11.2
Z2-151 (0")	34264	511	9.0
Z2-151 (0-6")	5499	70	
Z2-151 (0 °C)	810	16	11.6
Z2-152 (0")	521	14	6.7
Z2-153 (0 -6")	386	11	28.9
Z2-154 (0")	390	10	9.7

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moistur
Z2-155 (0")	383	11	4.8
Z2-155 (0-6")	362	10	-
Z2-156 (0")	2965	41	7.1
Z2-156 (0-6")	2574	37	•
Z2-150 (0 0) Z2-157 (0")	4610	62	2.1
Z2-157 (0")	2196	34	7.1
Z2-156 (0") Z2-159 (0")	2907	39	9.3
Z2-159 (0) Z2-159 (0-6")	4387	59	7.5
Z2-159 (0-0) Z2-160 (0")	2704	39	0.1
1 /	1021	20	7.1
Z2-161 (0")	643	15	7.1
Z2-161 (0-6")			70
Z2-162 (0")	4672	64	7.8
Z2-163 (0")	13518	167	3.3
Z2-164 (0")	8628	103	1.2
Z2-165 (0")	4127	53	8.7
Z2-165 (0-6")	3492	48	0.5
Z2-166 (0")	5897	73	2.7
Z2-167 (0")	326	10	9.1
Z2-167 (0-6")	154	7	0.0
Z2-168 (0")	501	13	3.1
Z4-169 (0")	46	5	8.2
Z4-170 (0")	976	19	9.4
Z4-170 (0-6")	918	18	-
Z4-171 (0")	249	8	10.3
Z4-172 (0")	483	12	7.9
Z4-172 (0-6")	490	12	-
Z4-173 (0")	413	12	0.5
Z4-174 (0")	322	9	8.0
Z4-174 (0-6")	455	12	_
Z4-175 (0")	1054	20	0.9
Z4-176 (0")	487	13	8.8
Z4-176 (0-6")	465	12	_
Z4-177 (0")	755	16	0.2
Z4-178 (0")	787	16	2.4
Z4-178 (0-6")	-	-	
Z4-179 (0")	505	12	8.3
Z4-180 (0")	462	12	7.8
Z4-180 (0)	443	11	7.6
` /	476	13	9.8
Z4-181 (0")		8	9.6 8.6
Z4-182 (0")	210	7	0.0
Z4-182 (0-6")	173		7 5
Z4-183 (0")	2278	34	7.5
Z4-184 (0")	10,533	127	-
Z4-184 (0-6")	1784	29	-
Z4-185 (0")	32061	450	17.7
Z4-186 (0")	6962	93	23.1

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z4-186 (0-6")	3739	45	-
Z4-187 (0")	264	9	20.7
Z4-188 (0")	1373	22	22.5
Z4-188 (0-6")	954	18	<i></i>
Z4-189 (0")	3014	37	14.0
Z4-189 (0")	4906	57	14.2
Z4-190 (0) Z4-190 (0-6")	2806	38	17.2
Z4-190 (0-0) Z4-191 (0")	1170	20	1.2
Z4-191 (0°) Z4-192 (0")	518	13	0.3
Z4-192 (0-6")	697	15	0.5
Z4-192 (0-0°) Z4-193 (0")	1148	19	1.9
* '	846	18	7.1
Z4-194 (0")	637	14	7.1
Z4-194 (0-6")		29	10.1
Z4-195 (0")	1872		10.1
Z4-196 (0")	1049	42	13.7
Z4-196 (0-6")	569	14	- -
Z4-197 (0")	2801	38	75.0
Z4-198 (0")	3220	46	24.6
Z4-198 (0-6")	1295	23	-
Z4-199 (0")	3875	50	23.3
Z4-200 (0")	10505	130	
Z4-201 (0")	24759	348	8.2
Z4-201 (0-6")	29728	429	-
Z4-202 (0")	3273	47	8.5
Z4-203 (0")	894	17	3.5
Z4-203 (0-6")	1227	21	-
Z4-204 (0")	3159	44	7.5
Z4-205 (0")	8891	91	7.3
Z4-205 (0-6")	1786	28	-
Z4-206 (0")	1022	19	7.1
Z4-207 (0")	1340	22	7.1
Z4-207 (0-6")	513	12	-
Z4-208 (0")	2334	33	3.2
Z4-209 (0")	2376	34	8.8
Z4-209 (0-6")	1222	21	
Z4-210 (0")	1613	25	5.1
Z4-211 (0")	1010	20	5.1
Z4-211 (0-6")	1079	20	•
Z4-212 (0")	2237	32	8.6
Z4-213 (0")	2644	39	4.3
Z4-213 (0-6")	6417	81	
Z4-214 (0")	27619	366	8.1
Z4-215 (0")	2/01/	200	0.1
Z4-215 (0")	2178	33	7.6
Z4-216 (0-6")	4705	61	7.0
· · · · ·	535	13	7.7
Z4-217 (0")	333	13	1,1

Table 1 (continued) XRF Sampling Data April 12-21 and October 20-22 2010 XRF Investigation Results Quemetco Inc. Facility Indianapolis, Indiana

Sample ID	Lead (ppm)	Error (+/- ppm)	% Moisture
Z4-218 (0")	2432	32	21.7
Z4-218 (0-6")	1294	22	
Z4-219 (0")	3345	43	0.7
Z4-220 (0")	2800	38	9.2
Z4-220 (0-6")	1644	26	-
Z3-221 (0")	2895	38	8.9
Z3-222 (0")	9267	110	3.3
Z3-222 (0-6")	5395	68	-
Z3-223 (0")	7105	71	1.9
Z3-224 (0")	94389	1892	8.2
Z3-224 (0-6")	46951	758	-
Z3-225 (0")	>100000		-
Z3-226 (0")	13176	166	3.7
Z3-226 (0-6")	11996	143	-
Z3-227 (0")	19022	230	3.5
Z3-228 (0")	5769	75	12.7
Z3-228 (0-6")	12729	162	-
Z3-229 (0")	6909	81	7.7

Note: Sample ID includes the zone, grid space and depth from which the sample was collected. For example, sample Z1-1 (0") was collected from the surface (0") in Zone-1, grid space 1.

^{- /} denotes value not recorded

Table 2
Lab Analysis and Corresponding XRF Sampling Data
April 12-21 and October 20-22 2010
XRF Investigation Results
Quemetco Inc. Facility
Indianapolis, Indiana

	XRF Analysis ¹	Lab Analysis ²	Relative Percent
Sample ID	Lead (ppm)	Lead (ppm)	Difference
Z1-19 (0")	8018	18000	76.7
Z1-21 (0-6")	5159	5300	2.7
Z1-33 (0")	1696	6100	113.0
Z1-55 (0-6")	539	670	21.7
Z1-60 (0")	489	550	11.7
Z1-86 (0-6")	315	270	15.4
Z1-104 (0-6")	540	460	16.0
Z2-151 (0")	34264	12000	96.2
Z4-177 (0")	755	670	11.9
Z4-198 (0-6")	1295	1600	21.1
Z4-201 (0-6")	29728	23000	25.5
Z4-205 (0")	8891	5900	40.4
	As	verage Relative Percent Difference	37.7

Note: Sample ID includes the zone, grid space and depth from which the sample was collected. For example, sample Z1-1 (0") was collected from the surface (0") in Zone-1, grid space 1.

¹XRF Analysis was performed in the field using an Innov-X Alpha Series XRF instrument.

²Lab Analysis was performed by Microbac Laboratories of Merrillville, Indiana.

Appendix A – Complete Field Data Table

4	•	· PSC	"204		
zene	sampleID	Northing	Easting	Date	Time .
1	21-160	506618.63	45761.04	4.(2.10 13-25 LB	13:33
= 1			4576202	4.12.10	ł <u> </u>
1	Z1-2(06°)	<u> </u>	1	4.12.10	17:13
1 1	Z1-3(0°)	500661.24	45763.59	4.12.10	13:55
	E1-4(0°)	500689.31	45756.86	4.12.10	14:02
] 1	21-4(0-6)	L.L		4.12.10	IS;27
1	£1-5(0")	500708.18	49767.25	4.12.10	14:13
	21-6(0")	500624.18	45737.38	4.12.10	14:56
	21-6(0-6)	1	1	4.12,10	17:15
1	21-760)	50062819	45734.67	4.12.10	15:03
1	Z1-8(0")	500665,28	45737.98	4.12.10	16:00
1	Z1-8(0-6°)		1	4.12.10	17:22
<u></u>	21-960)	500687.06	45742.39	4.12.10	/S:17 · ·
11	21-10(0")	500707.32	45740.82	4.62.10	15:22
1	Z1-10(06)	<u> </u>	J.	4.12.10	17:24
1	Z1-15 (0°)	50070499	45706.07	4.12.10	15:27
1	Z1-14(0")	500684.24	45711,47	4.12.10	16:00
1	21-1466")	<u></u>	<i>y</i>	4,12,10	17:21
1	21-13 (6")	500664.96	457 10,52	4.12.10	145:0.7
<u> </u>	21-1260)	5001/1263	45715.37	4,12.10	16:15
1_1_	21-1266)	1	J.	4.12.10	17:28
	21-11(0")	501629,18	45717.96	4.12.10	16:26
1	7-16(0")	50636.95	45689.01	4.12.10	16:37
- 1	Z1-666"	1 1		4.12.10	V7:29
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32,518 5482	/3.9		
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4,583 = 51			
3,435± 40	19.7		
2,419.531			
11,207 ±130	7.9		
18,967 ± 249	13.8		
58,132 11,018	7.2	, , , , , , , , , , , , , , , , , , , ,	
13,154±162	7.1		
15,112±174 4,067±43	17		
9,992±87	9.6		
3,673±42	7.4		
Z,086 + 25	14,7		
8,320£96	10.5		
8,300±92	14		-
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18,896±242	9.1		
29,739t 401	9,5		
13,665 - 176	8-2-		
8,909 -102	8.1		
4,848 158	8.7		

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1	Z/-50 (6")	500676.64	45528.14	4,14.10	13:28
1	21-800-6)	V	4.14.10	13-36-16 20
1	21-516")	500710-1B	45523.69	4.14.10	13 - 36
1	21-52(00)	(0°) 500 726 13	45524.98	4.14,10	13:42
1	21-52(06")	ĺ		4.14.10	16:15
1	21-56600)	500716.58	46 506, 25	4.14.10	13:51
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1	21-576-6)	· J		4.19.10	14:49
1	21-506)	500411.18	4 5536 69	4,18.10	2.40
1	21-590)	500591.23	455 39,55	4.15.10	12:58
1	21-41606) [1	4.15.10	14:47
.1	21-606)	506571,21	,		(3:07
1	21-616")	50056881	45524.56	4.15.10	13:26
A color	Z1-616-6)	↓ ;	1	4.15.10	16:53
	21-6260")				13:39
J.	天)-6260	50660519	45513.73	4.15.10	14:05
1	21-63(00)	500015.78	455/4.33	4.15.10	14:17
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94:51	61.81. H	75' S985h	821195009	(,07601-12	
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	Zone	SampleID	Northing	Easting	Pate	time
		21-1126	500531,05	45545.31	4.18.10	16:20
	1	ZI-113/0'	500440,55	45536.25	4.10./0	16:30
		21-11360-6	i i	L	4,18.10	16:46
\$*		21-114(0)	950-0745-60	45481,55	4,19,10	14:23
	1	Z1-1460-			4, 19, 10	and the state of t
		21-115(0)	1500770.72	49487,18	4 19-13	-41-245
$\frac{1}{n}$. $\frac{1}{n}$		71-1146	507M.72	45488.24	4,19.10	14:28
	1	21-114 (0-6	<u>i</u> 2	1	4.19,10	14.47
	1	ZI-1196"	510674.38	45481.89	4, 19.10	14:56
	Į.	21-116(0)	500676,85	45488.44	4.19.10	[G:01
		21-116(0-6)		1	41110	14.50
	\	21-11760)	500655.19	45488,39	4.19.10	15109
		21-118(0	150434-09	45487.81	4,11,10	15:22
		21-118(0-6") 1		4.49.10	14.42
		21-119(0")	500613.30	45487.43	4.19.19	15:27
		21-120(00)	600693.11	4548754	4,19.10	18:36
	1	Z1-120(06) \	1	4.10,10	14.48
		31-121(0")	500671.39	4848145	4.19.10	15:34
	Ĥ	2/-122(01)	500550.51	45408.01	U. 19.10	15:40
		21-122(0-6	9 1	1	4.19.40	14:43
		21-123/09	500527.13	45488.09	4.19.10	15:44
	Tagenty Constitution of the Constitution of th	Z1-124(0°)	500507.11	45487,70	4.19.10	15.49
		21-124(0-6)		1	4.19.10	. 1415)
		Z1-125(0)	600481.26	49181.16	4.19.10]5:55
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1	ZI-126(0°) 50026	1.90 45532.4	3 4,19.10	16:10	}	17416	
Ì	71-127(0°) 500 25	83,85 45534,6		16:18		293± 9	
	21-127(0-6)	<u> </u>	4:20.10,00	14:40		670 t 13	
	21-128 (0') 50030	5.34 45533.	19.10	6.28		496+9	
<u> </u>	21-129(0") 50032	9.95 48534		16:37		3571/0	
1	21-129(04) 1		4-19-10	14:45		438 11	
	21-130(0") 50035	4.37 45539.2	8 4.19.10	76:45	- -	345±9	
+182	Z2-1316" 5002	12.12 45 545k	64.20.10	10:20	.1	16516	
Lon	22-13/0-6) 1	1	4.20.10	14:53		300±6	
2	72-102(0) 50026	.44 Y\$575.1b	4.20.10	10:27		24277	
J.	Z2-133(6") 500267	,# 45596.0S	4.20.10	10:32		167±7	1
	22-133(0-6)		4.20.10	147:55		35129	
2	Z2-134(0") 500 785	1.16 45611,42	4,26,10	10:42	· ·	GHEILH	
2	Z 2 -135(o') 500 .168	05 4563891	4.20,10	loise7		2100±84	
2	72-135/66) L		t1, 20,10	14! 38	le le	4172 254	
2	72-1366 500 257	1.31 45553.88	4.20.10	11:00	n	483.4	
2	Z2-137 (01) 500 286.	SI 45574,74	- 박. 20,10	11:04	*	SSTU	
2	72-137(0-6")		4.20.10	14:34	,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	50 x 4	A STATE OF THE STA
2	Z2-1386") 500290	227 45593.8°	5 4.20,10	01:13	 !	52012.	
2	Z2-13960) 500302	.07 45616.49	4.20.10	11:20	···· }	20416	
2	Z2-139(0-6)		4.20.10	141.30		206 = 7	
<u>2</u>	22-1406 500 304.	37 45434.60	4.20.10	li:25		2301135	
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1	ZZ-141(0-6) 1		4.20.10	14:28	‡ **	7787 585	
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Appendix B – Laboratory Data April 2010 and Appendix C – Laboratory Data October 2010